



THE SOCIETY FOR
MODELING & SIMULATION
INTERNATIONAL

ANNSIM

Annual Modeling and Simulation Conference 2024

MAY 20-23, 2024

American University, Washington D.C., USA



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WIFI is available for free throughout the university.

Personal Belongings

SCS and American University are not responsible for any items left in the breakout rooms. We recommend that you make sure to take your things during lunch and before the end of each day.

Conference Organization

Organizing Committee

General Chair: Gregory Zacharewicz, IMT Mines Alès

Program Chair: Cristina Ruiz Martin, Carleton University, Canada

Proceedings Chairs: Bentley James Oakes, Polytechnique Montreal, Canada
Roman Cardenas Rodriquez, Universidad Politecnica de Madrid, Spain

Awards Chair: Hamdi Kavak, George Mason University, USA

Publicity Chairs

Latin America: Maria Julia Blas, Institute of Development and Design (INGAR)
Argentina USA

Canada: Amin Rahimian, University of Pittsburgh

Europe: Debraj Roy, University of Amsterdam

Asia: Georgios Theodoropoulos, Southern University of Science and Technology,

Africa: Oumar Maiga, University of Sciences, Techniques and Technologies of
Bamako (USTTB)

Oceania: Claudia Szabo, University of Adelaide

Conference Organization

Tracks and Chairs

Annual Simulation Symposium, Chairs: Joachim Denil, University of Antwerp, Belgium and Deniz Cetinkaya, Bournemouth University, UK

Humans, Societies, and Artificial Agents, Chairs: Taylor Anderson, George Mason University, USA and Petra Ahrweiler, Johannes Gutenberg University, Germany

Health and Medicine, Chairs: Özgür M. Araz, University of Nebraska, Lincoln, USA and Srinivas Venkatramanan, University of Virginia, USA

Cyber, Chairs: David Wells, MITRE, USA and Katherine Morse, Johns Hopkins University Applied Physics Laboratory, USA

Digital Twins and Cyber-Physical Systems, Chairs: Elisa Negri, Politecnico Milano, Italy and Mirigta Frasheri, Aarhus University, Denmark

Communications and Networking Simulation, Chairs: Abdolreza Abhari, Toronto Metropolitan University, Canada and Cheng-Bang Chen, University of Miami, USA

Sustainability and Resource Management, Chairs: Ursula Eicker, Concordia University, Canada and Ankica Barisic, Université Côte d'Azur, France

Business, Chairs: Mahsa Pourbafrani, RWTH Aachen University, Germany and Dominik Bork, TU Wien, Austria

Machine Learning and AI, Chairs: Jose Padilla, Old Dominion University, USA and Brandon Haworth, University of Victoria, Canada

Symposium on Simulation for Architecture and Urban Design (SimAUD), Chairs: Mohamed Aly Etman, Yale University, USA and Nina M. Sharifi, Syracuse University, USA

Tutorials, Chairs: Scott Rosen, MITRE, USA and Canan Gunes Corlu, Boston University, USA

Ph.D. Colloquium, Chairs: Margarita Vinnikov, New Jersey Institute of Technology, USA and Kevin Brown, Argonne National Lab, USA

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Welcome

Welcome from The Society for Modeling and Simulation International (SCS)

After months of planning, coordinating, and strategizing, SCS would like to welcome you to the Annual Modeling and Simulation Conference (ANNSIM '24).

It gives us great pleasure to extend a warm greeting to you at the ANNSIM '24 conference, where cutting-edge Modeling and Simulation (M&S) advances will be highlighted. Everyone at SCS has put in a lot of effort to make these three and a half days thrilling and to guarantee that ANNSIM'24 maintains its position as one of the premier M&S community events.

SCS carefully selects conference locations that minimize environmental impact that is beneficial in its effort to build a sustainable future. We are excited to announce we have partnered with American University as the host of ANNSIM'24. AU was chosen because of their unceasing efforts and recognition as a global university.

American University (AU) is home to more than 1,830 foreign students from 123 different countries, representing a wide range of cultures and perspectives. Their diversity is reflected in their faculty, academic programs, and exchanges. We are thankful to AU for granting SCS permission to hold ANNSIM'24 on its beautiful campus.

The conference this year offers a great opportunity to learn more about the most recent developments in M&S research and to network with other industry professionals.

As in previous years, the ANNSIM'24 program includes a world-class selection of peer-reviewed original research papers, tutorials, and Ph.D. Colloquium conversations and keynote speeches from our esteemed guests Dr. Moira Zellner, Principal Investigator from Northeastern University and Dr. Ashok Srinivasan, Program Director in the Office of Advanced Cyberinfrastructure at the National Science Foundation. Dr. Moira Zellner will host attendees on May 20, 2024, 9:30 a.m.-10:30 a.m. and Dr. Ashok Srinivasan will host attendees on May 21, 2024, 9:00 a.m. – 10:00 a.m.

We sincerely thank our track chairs and conference organizers, whose outstanding leadership in their respective fields was essential to the conference's overall success.

We appreciate the technical program committee and reviewers in all tracks for their thorough work and diligence during the rigorous peer review process, which allowed us to offer a program of high-quality presentations. We also thank the authors for submitting their work to ANNSIM'24 worldwide and Nathalie Japkowicz, Ph.D. Professor and Chair of The Department of Computer Science, American University for their support.

We hope you enjoy ANNSIM'24. We appreciate your participation in this year's event and hope to see you at more SCS activities in the future.

SCS Board of Directors

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- Create your own simulation objects
- Use your simulation model for emulation
- Add your own algorithms, control, and communication functions

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- Comprehensive Teaching Materials
- Teacher Training
- Guest Lectures



General Information

General Information

Registration

Your registration for SCS's 2024 Annual Modeling and Simulation Conference (ANNSIM'24) includes morning and afternoon breaks each day, the Monday evening reception, and access to all sessions, tutorials, and posters. All events will be located in Constitution Hall on Monday and Tuesday, and Don Myers Technology and Innovation Building (DMTI), on Wednesday and Thursday.

- **Registration Hours**

- ◇ **Monday, May 20, 2024** 8:30 a.m.—5:00 p.m.
- ◇ **Tuesday, May 21, 2024** 8:30 a.m.—5:00 p.m.
- ◇ **Wednesday, May 22, 2024** 8:30 a.m.—5:00 p.m.
- ◇ **Thursday, May 23, 2024** 8:30 a.m.—12:00 p.m.

Please note that the Registration Desk will be closed for lunch from Monday through Thursday. There will be a kick-off lunch on Monday, May 20, 2024. Lunch is on your own Tuesday-Thursday.

- **Continental Breakfast**

- ◇ **Monday, May 20, 2024** 8:00 a.m.—9:00 a.m.
- ◇ **Tuesday, May 21, 2024** 8:00 a.m.—9:00 a.m.
- ◇ **Wednesday, May 22, 2024** 8:00 a.m.—9:00 a.m.
- ◇ **Thursday, May 23, 2024** 8:00 a.m.—9:00 a.m.

- **Coffee Breaks**

- ◇ **Monday, May 20, 2024** 10:30 a.m.—11:00 a.m. | 3:00 p.m.—3:30 p.m.
- ◇ **Tuesday, May 21, 2024** 10:00 a.m.—10:30 a.m. | 3:00 p.m.—3:30 p.m.
- ◇ **Wednesday, May 22, 2024** 10:00 a.m.—10:30 a.m. | 3:00 p.m.—3:30 p.m.
- ◇ **Thursday, May 23, 2024** 10:30 a.m.—11:00 a.m.

- **Plenary Session with Keynotes (Constitution Hall)**

- ◇ **Monday** 9:00 a.m.—10:30 a.m.—SCS Keynote: [Dr. Moira Zellner](#)
- ◇ **Tuesday** 9:00 a.m.—10:00 a.m.—SCS Keynote: [Dr. Ashok Srinivasan](#)

General Information

Conference Meetings & Events Summary

- Monday**
 - Welcome Linda Aldoory, Dean of the College of Arts & Sciences
Academic Affairs, American University
Plenary Session with Keynote and Awards
(9:00 a.m.—10:30 a.m.)
 - Technical Sessions (11:00 a.m.—5:00 p.m.)
Kick-Off Lunch (12:30 p.m.—1:30 p.m.)
 - Tutorial I (11:00 a.m.—12:30 p.m.)
Tutorial II (1:30 p.m.—3:00 p.m.)
Tutorial III (3:30 p.m.—5:00 p.m.)
 - Welcome Reception (5:30 p.m.—7:00 p.m.); Constitution Hall
- Tuesday**
 - Plenary Session and Keynote Address (9:00 a.m.—10:00 a.m.)
Policy Modeling Meet Policy Practice Workshop
(9:00 a.m.—5:00 p.m.)
 - Technical Sessions (10:30 a.m.—5:00 p.m.)
Discriminatory Gaslighting and Imposter Syndrome Session
(5:15 p.m.—6:15 p.m.)
- Wednesday**
 - Panel: Advancing Educational and Research Programs: Insights
from Agencies (9:00 a.m.—10:00 a.m.)
 - Technical Sessions (10:30 a.m.—5:00 p.m.)
Tutorial IV (10:30 a.m.—12:00 p.m.)
Tutorial V (1:00 p.m.—2:30 p.m.)
 - Ph.D. Colloquium (10:00 a.m.—3:00 p.m.)
Panel Luncheon (12:00 p.m.—1:00 p.m.) (By Invitation)
- Thursday**
 - Technical Sessions (9:00 a.m.—12:30 p.m.)

General Information

Discriminatory Gaslighting and Imposter Syndrome

Keynote Speaker: Dr. Christy L. Pichichero

Chairs: Prof. Dr. Taylor Anderson, Margarita Vinnikov, and Cristina Ruiz Martin

May 21, 2024, Tuesday, 5:15p.m.

Location: DMTI 119

Pizza will be provided.

This event seeks to empower women and underrepresented groups in the modeling and simulation community. Attendees will have the opportunity to network, fostering a community that encourages collaboration, mentorship, and support. The event will feature a short talk by Dr. Christy Pichichero, Associate Professor of History and French, and the Director of Faculty Diversity at George Mason University's College of Humanities and Social Sciences. Dr. Pichichero will address "Discriminatory Gaslighting and Imposter Syndrome," offering insights into re-framing and overcoming such challenges faced by women and underrepresented groups in STEM. This event is open to all interested in supporting and building such a community."

Policy Modeling meets Policy Practice

Prof. Dr. Petra Ahrweiler, Prof. Dr. Taylor Anderson, Prof. Dr. Erik W. Johnston, Prof. Dr. Thomas Clemmons and Dr. Andreas Tolk

May 21, 2024, Tuesday, 9:00 a.m.

Location: Constitution Hall 1

The 1-day workshop will be attended by modelers as registered participants of ANNSIM 2024 and invited policy practitioners. The main objective is to provide a unique learning opportunity as a platform for discussion and interaction between modelers and practitioners. Policy modelers will present their ideas and approaches to practitioners for feedback and guidance and to learn about the policy world – its rationales, its everyday challenges, its priorities, its needs, its language, and its work environment, its wish list to modelers, its requirements on validity and credibility of models, and its current uptake of policy models.

General Information

Panel: Advancing Educational and Research Programs: Insights from Agencies

Keynote Speakers: KC Morris, Syed Mohammad, Ph.D. and Moria Fisher Bittman, Ph.D.

Chair: Dr. Ghaith Rabadi

May 22, 2024, Wednesday, 9:00 a.m.

Location: DMTI 119

In this panel, the speakers will give a brief overview of their research programs and provide insights into the latest research priorities through an interactive moderated discussion. The panel moderator will then answer questions from conference attendees.

AGU Tour, Advancing Earth and Space Sciences

2000 Florida Ave. NW,

Washington, DC 20009

May 23, 2024, Thursday, 1:00 p.m.

Location: At AGU location

AGU has taken a leadership role through a number of actions, including net zero energy renovation of their Washington, D.C. location. Net zero energy means the total annual amount of energy used by a building is equal to or less than the amount of energy created onsite through innovative technologies and renewable power generation. By achieving net zero energy, AGU's building will reduce energy, waste, and water consumption to almost zero and greatly reduce the carbon footprint, with the intent of putting excess power back on the grid. As one of the first renovated net zero buildings in a U.S. city and since AGU's building is on a compact urban lot, it is a model for how technologies can be combined and used to maximize efficiency.

Best Paper Award

The Overall Best Paper Awards for ANNSIM'24 will be announced during the plenary session. **May 20, 2024, Monday, 9:00 a.m.**

Keynotes

Keynote Information

Participatory Modeling for Collaborative and Equitable Planning: From Potential to Realization

Prof. Dr. Moira Zellner

Location: Constitution Hall

Monday, May 20, 2024 | 9:30 a.m.—10:30 a.m.

Abstract: Participatory modeling (PM) is a collaborative approach to formalize shared representations of a problem and, through the joint modeling process, design, and test solutions. This approach is particularly well-suited to address complex socio-environmental problems like climate change and its implications on equitable and sustainable resource management and landscape planning. Despite its potential to inform planning and policy, PM has yet to become a mainstream practice for decision-making. While most of the PM research and development has focused on modeling tools and engagement techniques, multiple other dimensions must be recognized and articulated for impactful planning support. I present a PM platform, *fora.ai*, that is supportive of the iterative steps in PM: problem definition and goal setting, preference elicitation, collaborative scenario-building, simulation, tradeoff deliberation, and solution-building. I demonstrate the platform's effectiveness when embedded in a stakeholder-led process that integrates diverse knowledge, data sources, and values in pursuit of equitable green infrastructure (GI) planning to address flooding. The immediate visualization of simulated impacts, followed by reflection on causal and spatial relationships and tradeoffs across diverse priorities, enhanced participants' collective understanding of how GI interacts with the built environment and physical conditions to inform their intervention scenarios. Participants shifted from untested beliefs to designs that were specifically tailored to the problem in the study area and the diversity of values represented, attending to both localized flooding and neighborhood-level impacts. They also derived generalizable design principles that could be applied elsewhere. I show how the combination of specific facilitation practices and platform features leveraged the power of data, computational modeling, and social complexity to contribute to collaborative learning and creative and equitable solution-building for urban sustainability and climate resilience. Grounded on a more fully integrated picture of PM, I propose an interdisciplinary research agenda to further evolve and scale up this practice for collaborative and just planning and policy. I highlight aspects of interface design and model biases, value elicitation and inclusion, management of diversity and innovation through facilitation, and the potential of novel computer-assisted assessment methodologies.



Keynote Information (Continued)

Biography: Moira Zellner’s academic background lies at the intersection of Urban and Regional Planning, Environmental Science, and Complexity. She has served as Principal Investigator and Co-Investigator in interdisciplinary projects examining how specific policy, technological, and behavioral factors influence the emergence and impacts of a range of complex socio-ecological systems problems, where interaction effects make responsibilities, burdens, and future pathways unclear. Her research also examines how participatory complex systems modeling with stakeholders and decision-makers can support collaborative policy exploration, social learning, and system-wide transformation. Moira has taught a variety of workshops on complexity-based modeling of socio-ecological systems, for training of both scientists and decision-makers in the US and abroad. She has served the academic community spanning across the social and natural sciences, as reviewer of journals and grants and as a member of various scientific organizations. She is dedicated to serving the public through her engaged research and activism.

Before coming to Northeastern, Moira was an Associate Professor in the Department of Urban Planning and Policy and the Institute for Environmental Science and Policy at University of Illinois at Chicago. She also headed the Urban Data Visualization Lab at UIC. Prior to her academic career, Moira worked as an environmental consultant for local and international environmental engineering firms and for the Undersecretary of Environment in the City of Buenos Aires, Argentina.

Keynote Information

NSF Programs to Democratize Cyberinfrastructure Access

Dr. Ashok Srinivasan

Location: Constitution Hall

Tuesday, May 21, 2024 | 9:00 a.m.—10:00 a.m.

Abstract: The talk will describe research, development, and learning/workforce development (LWD) programs within the Office of Advanced Cyberinfrastructure (OAC) in the CISE Directorate at the National Science Foundation. OAC's mission is to support advanced cyberinfrastructure to accelerate discovery and innovation across all science and engineering disciplines. The programs specifically addressed include: the Cyber Training Program for research workforce preparation; the OAC Core Research Program that is part of the CISE Core Research programs solicitation; and the Cyberinfrastructure for Sustained Scientific Innovation (CSSI) program for creating software and data cyberinfrastructure products and services.



Biography: Ashok Srinivasan is a Program Director in the Office of Advanced Cyberinfrastructure at the National Science Foundation and is involved in the Cyber Training, CSSI, PPOSS, ACED, and OAC Core programs. Srinivasan has a permanent position as a Professor of Computer Science and the William Nystul Eminent Scholar Chair at the University of West Florida and is a Fulbright Fellow. Srinivasan's research interests focus on the applications of high performance computing to science and public health policy. Results of that research to protect public health, especially during air travel, have been highlighted in over 300 news outlets around the world and cited in testimony to the US Congress.

Tutorials Information

Session Chair: Scott Rosen

Tutorial I: Introductory Tutorial on Agent-Based Modeling and Simulation

Date | Time: Monday, May 20, 2024 | 11:00 a.m.– 12:30 p.m.

Presenter: Chick Macal

Location: Constitution Hall 3

Tutorial II: Pattern Oriented Modeling and Test Driven Development: A Combined Approach to Improve Verification and Validation for Agent-based Models

Date | Time: Monday, May 20, 2024 | 1:30 p.m.– 3:00 p.m.

Presenter: Sarah Wise

Location: Constitution Hall 3

Tutorial III: Discrete-Event Modeling and Simulation-Based Development of Embedded Systems

Date | Time: Monday, May 20, 2024 | 3:30 p.m.—5:00 p.m.

Presenters: Cristina Ruiz Martin and Gabriel Wainer

Location: Constitution Hall 3

Tutorial IV: Discrete-Event Manufacturing Simulation Using the Open-Source Simproced Environment: A Tutorial

Date | Time: Wednesday, May 22, 2024 | 10:30 a.m.—12:00 p.m.

Presenters: Serghei Drozdov and Mehdi Dadfarnia

Location: DMTI-121

Tutorial V: Designing and Running Quantum Circuits on a Quantum Simulator

Date | Time: Wednesday, May 22, 2024 | 1:00 p.m.—3:00 p.m.

Presenter: Deniz Cetinkaya

Location: DMTI-121

Map

American University Campus



Directory

- 27 Anderson Hall
- 34 Asbury Building
- 40 Battelle-Tompkins
- 31 Beeghly Building
- 13 Bender Library
- 36 Butler Pavilion
- 45 Cassell Hall
- 26 Centennial Hall
- 24 Child Development Center
- 14 Clark Hall
- 7 Constitution Hall**
- 8 Don Myers Technology and Innovation Building
- 10 Duber Hall
- 11 East Quad Building
- 9 Federal Hall
- 4 Friedheim Quadrangle
- 16 Gray Hall
- 30 Hall of Science
- 20 Hamilton Building
- 42 Hughes Hall
- 6 Hurst Hall
- 19 Jack Child Hall
- 23 Jacobs Recreation Complex
- 2 Katzen Arts Center
- Welcome Center*
- 3 Kay Spiritual Life Center
- 5 Kerwin Hall
- 41 Kogod School of Business
- 21 Kreeger Building
- 44 Leonard Hall
- 28 Letts Hall
- 35 Mary Graydon Center
- 17 McCabe Hall
- 43 McDowell Hall
- 29 McKinley Building
- 25 Media Production Center
- 1 Nebraska Hall
- 33 Osborn Building
- 46 President's Office Building
- 32 Reeves Building
- 18 Rockwood Building
- 15 Roper Hall
- 12 School of International Service
- 37 Sports Center
- Bender Arena*
- 38 Sports Center Annex
- 22 Watkins Building
- 39 Woods-Brown Amphitheater

Updated April 2021

Agenda at a Glance

ANNSIM'24 Ses

		ANSS	CNS	S&RM	BI&PM	Ph.D Co
Monday 20-May-24						
9:00 a.m. — 10:30 a.m.	SCS Plenary					
10:30 a.m.—11:00 a.m.	Break					
11:00 a.m.—12:30 p.m.	Session Block I		CH 2			
12:30 p.m.—1:30 p.m.	Kick-Off Lunch					
1:30 p.m. — 3:00 p.m.	Session Block II		CH 2			
3:00 p.m. — 3:30 p.m.	Break					
3:30 p.m. — 5:00 p.m.	Session Block III	CH 2				
Tuesday 21-May-24						
9:00 a.m. — 10:00 a.m.	SCS Plenary					
10:00 a.m.—10:30 a.m.	Break					
10:30 a.m.—1:00 p.m.	Session Block V	CH 2			CH 3	
12:00 p.m.—1:00 p.m.	Lunch on your own					
1:00 p.m. — 3:00 p.m.	Session Block VI	CH 2				
3:00 p.m. — 3:30 p.m.	Break					
3:30 p.m. — 5:00 p.m.	Session Block VII	CH 2				
Wednesday 22-May-24						
9:00 a.m. — 10:00 a.m.	Session Block VIII					
10:00 a.m.—10:30 a.m.	Break					
10:30 a.m.—12:00 p.m.	Session Block IX					DMTI-11
12:00 p.m.—1:00 p.m.	Lunch on your own					
1:00 p.m. — 3:00 p.m.	Session Block X					DMTI-11
3:00 p.m. — 3:30 p.m.	Break					
3:30 p.m. — 5:00 p.m.	Session Block XI					
Thursday 23-May-24						
9:00 a.m. — 10:30 a.m.	Session Block XII					
10:30 a.m.—11:00 a.m.	Break					
11:00 a.m.—12:30 p.m.	Session Block XIII			DMTI-121		

missions at a Glance

	H&M	SimAUD	DTI	DT II	DTIII	DTIV	HSA	ML&AI & Cyber
		CH 1						
		CH 1						
		CH 1						
	CH 3							
9								
9			DMTI-213					
				DMTI-213			DMTI-119	
					DMTI-213		DMTI-119	DMTI-121
						DMTI-213	DMTI-119	

Daily Agendas

Monday

Annual Modeling and Simulation Conference 2024

Agenda

Monday, May 20, 2024

Simulation of Architectural and Urban Design (SimAUD)

Session I **11:00 a.m.—12:30 p.m.** **Room: Constitution Hall 1**
Session Chairs: Nina Wilson and Mohamed Aly Etman

Simulation and Visualization Tools in Urban Design Practice: How Could They Support Planners and Designers in Shaping a Sustainable Urban Form? by Firas Al-Douri

Investing Urban Neighborhood Similarity: A Case Study on Machine Learning vs. Vector Distance vs. Expert Knowledge by Gabriel Wurzer, Wolfgang E. Lorenz, Stefan Bindreiter, Niko Ugljanin, Ernst Alexander Dengg and Volker Pachauer

Enhancing Spatial Configurations in Informal Learning Spaces: An Early-Phase Design Decision-Making Framework by Song GUO, Weimin Zhuang and Xiaoyue Yan

Session II **1:30 p.m.—3:00 p.m.** **Room: Constitution Hall 1**
Session Chairs: Nina Wilson and Mohamed Aly Etman

Designing for Daylight: An Exploration of Origami-Inspired Interior Shading Screens by Niloofar Nikookar and Azadeh Sawyer

Evaluating Panoramic 3D Estimation in Indoor Lighting Analysis by Zining Cheng and Guanzhou Ji

NLP-Driven Analysis of Public Emotions Toward Indoor Air Quality in the United States by Mehdi Ashayeri, Soroush Piri and Narjes Abbasabadi

Session III **3:30 p.m.—5:00 p.m.** **Room: Constitution Hall 1**
Session Chairs: Nina Wilson and Mohamed Aly Etman

A novel PCM-integrated Electrochromic Glazing (PCM-ECG) System for Improving Energy Performance in Cooling Season by Qian Jin, Qiuting Sun and Xiangyu Long

Three Dimensional Automated Long-term Monitoring of Bio-based Building Elements in Outdoor Conditions by Martin Tamke, Shahriar Akbari and Mette Ramsgaard Thomsen

Urban Lung: Exploring the Potential of Passive Facade-integrated Vertical Convection Facilitation Systems With Architectural Ceramic in High-density Urban Environments by Xinlin Lu, Chunze Li, Tinghui Mo and Yidan Wang

Dynamic Insulated Shutter System for a Double-Layer Building Façade: A Case Study with Physical Prototype by Zhirui Bian, Li Pan, Xiang Zhang, Max Hakkarainen, William Braham and Dorit Aviv

Annual Modeling and Simulation Conference 2024

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Monday, May 20, 2024

27th Communications and Network Simulation (CNS)

Session I **11:00 a.m.—12:30 p.m.** **Room: Constitution Hall 2**
Session Chair: Abdolreza Abhari

Machine Learning Based Small-scale Parameter Extraction for Improved Wireless Channel Model Fidelity by Benjamin Earle, Ala'a Al-Habashna, Gabriel Wainer, Xingliang Li and Guoqiang Xue

Machine Learning Based Techniques for Enhancing the Performance of Inter-cloud Data Transfers by Juan Contreras, Shikharesh Majumdar and Ali El-Haraki

Tafe-AI: A Trust-Augmented Fog and Edge AI Enabled Network Integrated with Decentralized Identity by Shakirabanu Kaleel and Abdolreza Abhari

Session II **1:30 p.m.—3:00 p.m.** **Room: Constitution Hall 2**
Session Chair: Abdolreza Abhari

Brooks-Iyengar Algorithm in Pub/Sub Architecture Using the DEVS Formalism by Iman Alavi Fazel and Gabriel Wainer

DEVS Based Robust Communication Protocol for Inter-Simulation Communication in Cadmium by Sasisekhar Govind and Gabriel Wainer

Simulation of Parallelization of Deep Neural Networks by Dividing Data by Jorge A. Lopez and Abdolreza Abhari

Annual Modeling and Simulation Conference 2024

Agenda

Monday, May 20, 2024

56th Annual Simulation Symposium (ANSS)

Session III **3:30 p.m.—5:00 p.m.** **Room: Constitution Hall 2**
Session Chair: Deniz Cetinkaya

Designing a Resilient Infrastructure Learning Game to Evaluate Maintenance Decisions by Nischal Newar, Shima Mohebbi and Pavithra Sripathanallur Murali

Modelling Decarbonization Strategies for Urban Energy Systems by Saeed Ranjbar, Oriol Gavalda, Abolfazl Rezaei and Ursula Eicker

Assimilating UAV-Based Observation Data for Wildfire Spread Simulation by Mu Ge and Xiaolin Hu

Tuesday

Annual Modeling and Simulation Conference 2024

Agenda

Tuesday, May 21, 2024

56th Annual Simulation Symposium (ANSS)

Session V **10:30 a.m.—12:00 p.m.** **Room: Constitution Hall 2**
Session Chair: Gregory Zacharewicz

Functional Mock-up Interface Based Simulation of Continuous time Systems in Cadmium by Ritvik Joshi, James Nutaro, Bernard Zeigler, Gabriel Wainer and Doohwan Kim

Flattened Parallel DEVS Simulations on GPU Architectures by Guillermo Trabes, Alonso Inostrosa-Psijas, Gabriel Wainer and Veronica Gil-Costa

Real-time Interactive External Labeling for Dynamic Visualization by Shan Liu and Yuzhong Shen

Session VI **1:00 p.m.—3:00 p.m.** **Room: Constitution Hall 2**
Session Chair: Yon Vanommeslaeghe

Hybrid Simulation-Optimization Model to Design Autonomous Delivery Vehicles Networks by Erik Roy-Veilleux, Farouq Halawa, Will Arling and Raashid Mohammed

Surrogate Modelling with Deep Learning for Optimizing Manufacturing Assembly Lines by Maryam SAADI, Vincent Bernier, Greg Zacharewicz and Nicolas Daclin

Comparing Simulated Autonomous Swarm Systems with Agent-Based Modeling by Arsenio Gumahad and Andrew Collins

Using Agenda-Based Modeling to Calculate an EASE Score: Evacuation with Acceptable Simplicity in Emergencies by Arthur Perron, Noah Hall, Hila Sabouni, Charlton McArthur, Katherine Nelson, Mohammadamin Sanaei, Nikoo Javadpour and Stephen Gilbert

Session VII **3:30 p.m.—5:00 p.m.** **Room: Constitution Hall 2**
Session Chair: José Luis Risco Martín

xDEVS no-std: A Rust Crate for Real-Time DEVS on Embedded Systems by Roman Cardenas, Pedro Malagon, Patricia Arroba Garcia and Jose L. Risco-Martin

A Novel Real-Time DEVS Simulation Architecture with Hardware-in-the-Loop Capabilities by Óscar Fernández-Sebastián, Roman Cardenas, Patricia Arroba Garcia and Jose L. Risco-Martin

Integrating DEVS and FMI 3.0 for the Simulated Deployment of Embedded Applications by Yon Vanommeslaeghe, Bert Van Acker, Joachim Denil and Paul De Meulenaere

Annual Modeling and Simulation Conference 2024

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Tuesday, May 21, 2024

Business (BI&PM)

Session V **10:30 a.m.—12:00 p.m.** **Room: Constitution Hall 3**

Simulation-Based Predictive Process Mining with EBPMN: Methods, Challenges and Opportunities
by Paolo Bocciarelli and Andrea D'Ambrogio

DEVS Formal Modeling and Simulation in Manufacturing Systems by Cristina Ruiz Martin and Gabriel Wainer

A BPMN-Based Approach to Support Smallholders' Business Model Simulation by Sihem Mallek Daclin, Mariane El-Kassis, Nicolas Daclin and Greg Zacharewicz

Health and Medicine (H&M)

Session VI **1:00 p.m.—3:00 p.m.** **Room: Constitution Hall 3**

Session Chair: Nasim Sabounchi

Simulation of Public Transportation Operations for Infectious Disease Spreading Among Passengers by Longfei Zhou and Chun Sen Liu

Exploring Vaccine Hesitancy Dynamics Through the Health Belief Model: A System Dynamics Modeling Approach by Justine Maffei, Rachel Thompson, Mahdi Najafabadi, Terry Huang, David Lounsbury, Turner Canty, Denis Nash, McKaylee Robertson and Nasim Sabounchi

VISHN: Viral Load and Immunity Simulation on a Host Network by Jeremy Nachison and Srini Venkatramanan

Optimized Model Selection for Estimating Treatment Effects from Costly Simulations of the US Opioid Epidemic by Abdulrahman Ahmed, M. Amin Rahimian and Mark S. Roberts

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Wednesday

Annual Modeling and Simulation Conference 2024

Agenda

Wednesday, May 22, 2024

Digital Twins I and Digital Twins II

Session X **1:00 p.m.—3:00 p.m.**

Room: DMTI 213

Session Chair: Elisa Negri

Digital Twins I

Automated Generation of Urban Digital Shadows using Open Data by Susanna Cao, Kai Franke, Tobias Koch and Tamara Lenhard

Simulation Cloning for Digital Twins: A Scalable Approach by Srikanth Yoginath, Pratihtha Shukla, Sudip Seal and James Nutaro

Monitoring Reconfigurable Simulation Scenarios in Co-Simulated Digital Twins by Simon Thrane Hansen, Eduard Kamburjan and Zahra Kazemi

Evaluating Open-Source Tools for Heterogeneous Model-based Digital Twin Development: A Microbrewery Case Study by Ander Lee, David Manrique Negrin and Loek Cleophas

Session XI **3:30 p.m.—5:00 p.m.**

Room: DMTI 213

Session Chair: Alonso Inostrosa-Psijas

Digital Twins II

Scalable Building Energy Efficiency Balancing by Philipp Zech, Daniel Plörer, Rainer Pfluger and Ruth Breu

Digital Twin for Sustainable Supply Chain of Climacteric Fruits by Souvik Barat, Parijat Deshpande, Abhishek Yadav, Aditya Paranjape, Vinay Kulkarni, Beena Rai, Harshil Ketan Vora, Sakshi Kumar, Ishan Pahare, Pratik Mittal, Mayank Bansal and Vijay Sai

Optimizing Humanitarian Logistics with Deep Reinforcement Learning and Digital Twins by Bulent Soykan and Ghaith Rabadi

Annual Modeling and Simulation Conference 2024

Agenda

Wednesday, May 22, 2024

Ph.D. Colloquium

Session IX **10:30 a.m.—12:00 p.m.** **Room: DMTI 119**

Session Chairs: Margarita Vinnikov and Kevin A. Brown

Opening Talk

Artificial Intelligence, Human Agency and Social Decision-Making in Water Management Systems by Blanca Luque Capellas

Coupling Simulation and AI for Assembly Line Optimization by Maryam Saadi, Bernier Vincent, Greg Zacharewicz and Nicolas Daclin

Leveraging Supervised Machine Learning to Predict Health Behaviors in Spatial Agent-Based Models of Disease Spread by Emma Von Hoene

Extracting M-Mimo Channel Characteristics From Limited CSI Logs Using Machine Learning by Benjamin Earle

DEVS Based Robust Communication Protocol for Inter-Simulation Communication in Cadmium by Sasisekhar Mangalam Govind

Digital Twins for Continuous Deployment in Model-Based Systems Engineering of Cyber-Physical Systems by Joost Mertens

Session X **1:00 p.m.—3:00 p.m.** **Room: DMTI 119**

Session Chairs: Margarita Vinnikov and Kevin A. Brown

Simulating Small Modular Reactor Cyber Security by Michael Zamperini

A Physical-Behavioral Framework for Capturing the Complexity of Flood Evacuation Behaviors in Agent-Based Models by Szandra Peter

Estimating Treatment Effects from Costly Samples of Population-scale Models by Abdulrahman Ahmed

Driver-in-the-Loop Electric Vehicle Routing: Simulation, Optimization, and Driver Training Models by Ahmad Bany Abdelnabi

Game-Based Learning with Augmented Reality by Kantida Nanon

Graph-Based Intelligent Decision-Making in the Early Stage of Architectural Design by Song Guo

Improving the Modified Linearly Implicit Quantized State System Methods by Elmongi Elbellili

Real-Time Interactive External Labeling for Dynamic Visualizations by Shan Liu

Annual Modeling and Simulation Conference 2024

Agenda

Wednesday, May 22, 2024

Humans, Societies and Artificial Agents (HSAA)

Session XI

3:30 p.m.—5:00 p.m.

Room: DMTI 119

Session Chairs: Taylor Anderson and Petra Ahrweiler

Simulating Elections in the Context of Voter Behavior and Election Rules by Michael Hammer and Hamdi Kavak

The Interaction Between Heterogeneous Voting Strategies and Dynamic Vote-seeking Campaigns: An Agent-Based Model by Stephen Davies and Harmony Peura

Simulating Change-A Systematic Literature Review of Agent-Based Models for Policy-Making by Michael Belfrage, Fabian Lorig and Paul Davidsson

Thursday

Annual Modeling and Simulation Conference 2024

Agenda

Thursday, May 23, 2024

Machine Learning & Artificial Intelligence (ML & AI) and Cyber

Session XII **9:00 a.m.—10:30 a.m.** **Room: DMTI 121**
Session Chairs: Maxim Malikov and Jose Padilla

Multi-Agent Imitation Learning for Agent Typification: A Proof-of-Concept for Markov Games with Chess by Helen Haase, Daniel Glake, and Thomas Clemen

Evaluation Concept for Order Release Based on Simulation and Reinforcement Learning Against Changes to the Production Configuration by Tim Janke, Michael Riesener, Seth Schmitz, Judith Fulterer, and Hendrik Eisbein

Cyber

Simulation-Based Study on False Alarms in Intrusion Detection Systems for Organizations Facing Dual Phishing and DoS Attacks by Jeongkeun Shin, L. Richard Carley, and Kathleen M. Carley

Sustainability and Resource Management (S&RM)

Session XII **11:00 a.m.—12:30 p.m.** **Room: DMTI 121**
Session Chair: Ursula Eicker

A Short-Term Charging Waiting Time Estimation Approach Using Recurrent Mixture Density Networks and Queuing Model by Xiaoming Li, Chun Wang, and Xiao Huang

A Simulation-Based Optimization Approach Towards Human-Centric Scheduling in Presence of Heterogeneous Workforce by Amel Jaoua, Elisa Negri, Hajer Hamdaoui and Safa Bhar Layeb

Comparing Short vs. Long-Term Decision Strategies in Sustainable Human Resource Management: A Deep Reinforcement Learning Application by Vahid Gholamzadeh, Behrooz Khorshidvand, and Adel Guitouni

Annual Modeling and Simulation Conference 2024

Agenda

Thursday, May 23, 2024

Humans, Societies and Artificial Agents (HSAA)

Session XII **9:00 a.m.—10:30 a.m.** **Room: DMTI 119**
Session Chairs: Taylor Anderson and Petra Ahrweiler

Incorporating Trauma Propagation and Transmission in Agent-Based Models: A Preliminary Framework by Nicholas Bishop and Hamdi Kavak

Exploring the Dynamics of Gene Drive Mosquitoes within Wild Populations using an Agent-Based Simulation by Sureni Wickramasooriya, Imran Mahmood, Anisoara Calinescu, Michael Wooldridge and Gregory Lanzaro

Data-Driven Reconstruction of Processes from Pedestrian Trajectories by Elena Eftimova, Christoph Nellinger and Tobias Koch

Session XIII **11:00 a.m.—12:30 p.m.** **Room: DMTI 119**
Session Chairs: Taylor Anderson and Petra Ahrweiler

Beyond Local Interactions: Revisiting Spatial Evolutionary Prisoner's Dilemma by Maxim Malikov and Polina Prokofyeva

Using ABM and Serious Games to Create "Better AI" by Petra Ahrweiler, Nigel Gilbert, George Kampis, Zsolt Juranyi, Albert Sabater Coll, Martha Bicket, Blanca Luque Capellas and David Wurster

Analyzing Transport Policies in Developing Countries with ABM by Kathleen Salazar-Serna, Lorena Cadavid and Carlos J. Franco

Annual Modeling and Simulation Conference 2024

Agenda

Thursday, May 23, 2024

Digital Twins III and Digital Twins IV

Session XII **9:00 a.m.—10:30 a.m.** **Room: DMTI 213**
Session Chair: Alonso Inostroza-Psijas

Digital Twins III

A Simulation-Based Approach for Evaluating Shared Control Algorithms for Mobile Robots by Ahmet Saglam and Yiannis Papelis

Using Co-Simulation and Time Signal at Red (TSAR) to Determine Impact of Driver Behavior on Rail Network Performance by Kenneth Pierce, Anirban Bhattacharyya, David Golightly, Pedro Pinto da Silva, Seb Merricks, Roberto Palacin and Ziqi Guo

Review on Digital Twin Modelling Applications to Support Human-Centricity in Manufacturing by Laila El Warraqi, Lorenzo Ragazzini and Elisa Negri

Session XIII **11:00 a.m.—12:30 p.m.** **Room: DMTI 213**
Session Chair: Cristina Ruiz Martin

Digital Twins IV

Integrated Realtime Simulation of Voltage Regulation Algorithms in a Microgrid with DERs: Leveraging the DERConnect Testbed by Sayed Abdullah Sadat, Benjamin Hwang, Kohei Murakami, Jan Kleissl, Jorge Cortes and Adil Khurram

A Simulation-based Real-Time Deep Reinforcement Learning Approach for Fighting Wildfires by Jose Tupayachi, Madelaine Martinez Ferguson, and Xueping Li

Digital-Twin for Surgical Tool-Tissue Interaction: Systems Perspective by Srikar Annamraju, Paul Jeziorczak, Qianhe Ye and Inki Kim

Things to Do in Washington, D.C.

1. Lincoln Memorial

<https://www.nps.gov/linc/index.htm>

2 Lincoln Memorial Circle, NW, Washington 20002

The Greek Doric-style memorial sits on the western end of the National Mall and has been the setting of many famous speeches throughout its history. Admission is free and 24 hours a day.

2. National Gallery of Art

<https://www.nga.gov/>

West Building, 6th St and Constitution Ave NW

This national art museum holds over 141,000 works of Western Art, spanning from the middle ages through today. It's completely free to visit and opened daily from 10:00 a.m. to 5:00 p.m.

3. Smithsonian National Museum of Natural History

<https://naturalhistory.si.edu/>

1000 Madison Drive NW Washington, D.C. 20560

Established in 1910 and located on the National Mall, this prestigious museum, part of the Smithsonian Institution, holds the world's most extensive collection of natural history specimens and human artifacts including the remains of dinosaurs and tools used by early man. Admission is free.

4. National Air and Space Museum

<https://airandspace.si.edu/>

6th Street and Independence Ave SW, Washington, DC 20560

Free time-entry passes are required. Please see the Museum's website for information. The Smithsonian National Air and Space Museum maintains the largest collection of historic air and spacecraft in the world.

5. Library of Congress

<https://www.loc.gov/>

Thomas Jefferson Building

10 First Street SE, Washington, DC 20540

Though the Library of Congress doesn't own every book ever published, it sure has most of them, with 532 miles of shelves and 115 million items, with 7,000 added each working day. As part of a greater congestion management strategy, free timed-entry tickets are required to enter the Library. Individuals can reserve up to 20 free timed-entry tickets here. external link Groups of 21 people or more must request free timed-entry tickets by completing our group registration form. Visitation peaks at the Library from March through July - during this time, expect longer than normal wait times to navigate security screening to enter the building. A limited number of timed-entry tickets external link are available for each day the Library is open to the public. Visitors can reserve timed-entry tickets external link up to 30 days in advance on a rolling basis. Same-day timed-entry tickets external link are released online at 9:00 a.m. EST each day the Library is open to the public.

Things to Do in Washington D.C.

6. United States Holocaust Memorial Museum

<https://www.ushmm.org/>

100 Raoul Wallenberg Place, SW, Washington, DC 20024-2126

A living memorial to the Holocaust, the United States Holocaust Memorial Museum inspires citizens and leaders worldwide to confront hatred, prevent genocide, and promote human dignity. The Museum is open seven days a week. It is closed on Yom Kippur and Christmas Day. Free timed-entry tickets are required to enter the Museum building and can be reserved on our website.

7. Vietnam Veterans Memorial

<https://www.nps.gov/vive/index.htm>

5 Henry Bacon Drive NW, Washington 20002

Located north of the Lincoln Memorial near the intersection of 22nd St. and Constitution Ave. NW, Vietnam Veterans Memorial is free to visit and is open 24 hours a day. The memorial includes the names of over 58,000 servicemen and women who gave their lives in service in the Vietnam Conflict. The memorial also includes "The Three Servicemen" statue and the Vietnam Women's Memorial.

8. National World War II Memorial

<https://www.nps.gov/wwii/planyourvisit/basicinfo.htm>

1750 Independence Ave. SW, Washington 20024

Consisting of 56 pillars that represent the U.S. states and territories, this impressive national monument honors all who served in the U.S. Armed Forces.

9. Korean War Veterans Memorial

<https://www.nps.gov/kowa/index.htm>

10 Daniel French Dr, SW, Washington 20002

The Korean War Veterans Memorial was dedicated in 1995. It's Wall of Remembrance and 19 stainless steel statues commemorate the sacrifices of the millions of Americans and allied partners who fought during the Korean War. The Korean War Veterans Memorial is a unit of National Mall and Memorial Parks.

10. National Museum of African American History and Culture

<https://nmaahc.si.edu/>

1400 Constitution Ave NW, Washington, DC 20560

This 10-story Smithsonian Institution museum is dedicated to showcasing the African-American way of life, culture, and experiences through America's history. The National Museum of African American History and Culture is the only national museum devoted exclusively to the documentation of African American life, history, and culture. It was established by an Act of Congress in 2003, following decades of efforts to promote and highlight the contributions of African Americans. To date, the Museum has collected more than 40,000 artifacts and nearly 100,000 individuals have become members. The Museum opened to the public on September 24, 2016, as the 19th museum of the Smithsonian Institution.

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